

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
14 October 2004 (14.10.2004)

PCT

(10) International Publication Number  
**WO 2004/088359 A3**

(51) International Patent Classification<sup>7</sup>: **G02B 6/00**

(21) International Application Number:  
PCT/IL2004/000283

(22) International Filing Date: 29 March 2004 (29.03.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
155195 2 April 2003 (02.04.2003) IL

(71) Applicants (for all designated States except US): **BLUE-BIRD OPTICAL MEMS LTD.** [IL/IL]; 10 Bluebird St., Isfiya, 30090 (IL). **OZ OPTICS LTD.** [CA/CA]; 219 Westbrook Road, Carp, Ontario K0A 1L0 (CA).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **JACOBSON, Claudio G.** [IL/IL]; 86 HaBrosh Street, Binyamina, 30500 (IL). **NEMIROVSKY, Amikam** [IL/IL]; 7 Golda Meir Street, Haifa, 34982 (IL). **SEZERMAN, Omur** [CA/CA]; 18 Tanner Street, Crescent, Kanata, Ontario K2K 2M7 (CA).

**KALDOR, Shmuel** [IL/IL]; 2/19 Kashtan Street, Haifa, 34984 (IL). **SIDOROV, Elena** [IL/IL]; 27 Adam HaCohen Street, Haifa, 32714 (IL).

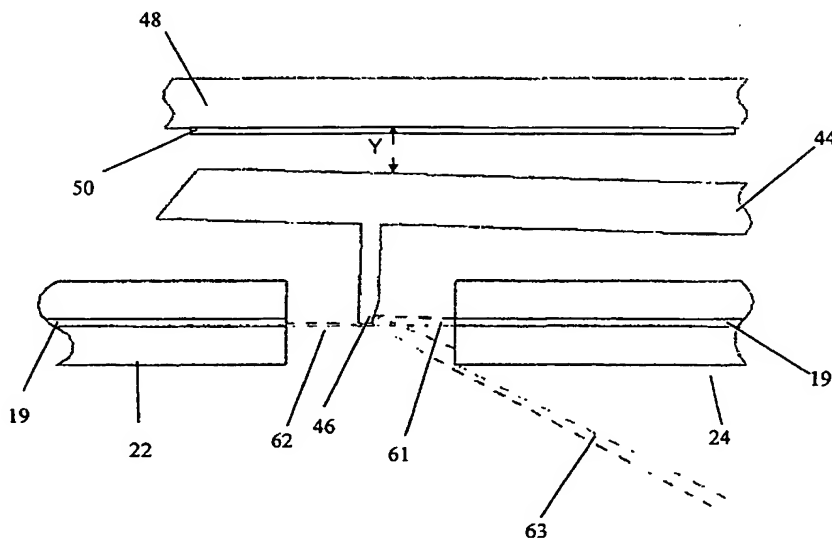
(74) Agent: **LANGER, Edward; SHIBOLETH, YISRAELI, ROBERTS, ZISMAN & CO.**, 46 Montefiore St., Tel-Aviv, 65201 (IL).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK,

[Continued on next page]

(54) Title: A DEVICE AND A METHOD FOR INTEGRATED MULTI-CHANNEL MEMS VARIABLE OPTICAL ATTENUATORS



(57) Abstract: A single or multi-channel MEMS (Micro Electro Mechanical Systems) variable optical attenuator employing a novel construction method. An optical fiber (18) or waveguide is secured on a substrate (32), for example in a groove (36) formed in the substrate (32), and is then cut to an appropriate depth (by dicing, etching, laser cutting or any other means) for ensuring alignment between the two fiber segments (22, 24) thus obtained, thus eliminating prior art misalignment problems. After securing and cutting of the fiber (18), a MEMS shutter (26) is arranged for dynamically controlled positioning in the gap (28), to block any required amount of the power of an optical signal that propagates in the gap (28) between the optical fiber segments (22, 24). The amount of blocking is controlled using electrostatic actuation or by any other means, to provide the instantaneously required attenuation



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**Published:**

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

**(88) Date of publication of the international search report:**  
30 June 2005